

Some Points in the Anatomy of *Melongena melongena*. By J. HENRY VANSTONE, Royal College of Science, S. Kensington. (Communicated by Prof. G. B. HOWES, F.L.S.)

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(PLATE XXVIII.)

THE genus to which this Gasteropod belongs was founded by Schumacher in 1817 as a refuge for certain waifs from other genera. The shells of the genus have often been figured and described under the names of *Cassidula*, *Murex melongena*, *Pyrula melongena*, *P. tuba*, and *P. galeodes*. The structure of the animal, however, appears to have been ignored (so far as I have been able to ascertain) by all writers except the French conchologist Souleyet\*.

This naturalist, more than forty years ago, gave an account of the anatomy of *Pyrula tuba*, which is now placed in the genus *Melongena*. On reference to the description and figures it will be seen that *M. tuba* agrees in the main with the species now under consideration †.

Concerning the viscera Souleyet rightly remarks that "l'appareil digestif offre le plus grand analogue avec celui des Buccins, des Pourpes," and as in these Prosobranchs there is present a long proboscis which, when retracted, is folded upon itself (Pl. XXVIII. fig. 2 b). The radula, in common with that of other members of the Turbinellidæ, bears teeth in three series—a central tricuspid series and two lateral bicuspid rows.

The œsophagus ( $\alpha'$ , figs. 1–2) is long and narrow and throughout its distal half its internal walls are longitudinally plicated ( $\alpha'$ , fig. 4), as is the case in *Pteroceras* and certain allied forms. Souleyet remarks that in *Melongena tuba* the œsophagus, at first of small calibre, afterwards became dilated and "cette seconde partie de l'œsophage forme une sorte de prolongement cæcal;" but I have not observed either of these characters in *M. melongena*.

The stomach, which is remarkable in several points, lies (*st.*, fig. 1) packed away between the liver (*lv.*) and genital gland (*g.g.*) in the topmost whorls of the shell, and is generally left behind on the extraction of the animal. This organ is very small in

\* Souleyet, 'Voyage de la Bonite,' ii. 1852, p. 614.

† Unfortunately the specimens at my disposal had been imperfectly preserved, and consequently I have been compelled to confine my attention to certain parts of the alimentary canal.

proportion to the size of the animal's body, for in a specimen whose shell was 12 centimetres long and 8 centimetres broad at its widest part, the stomach only measured about 9 by 2·5 millimetres. In none of the specimens examined did the diameter exceed 3 millimetres. The calibre of this organ is but slightly in excess of that of the œsophagus and intestine, and in this it differs from *M. tuba*, in which the stomach is more expanded and sac-like.

The chief point of interest, however, is not seen until the stomach is opened, and if present in *M. tuba* it was overlooked by Souleyet. Within the stomach of *M. melongena*, on the upper and lower walls, there is a longitudinal series of hard cuticular plates and knobs lineally disposed on a median ridge (*p.g.' p.g.*", figs. 3, 4). At the curvature of the stomach the rows take their origin in an irregular group of somewhat larger knobs and they are continued down to within a short distance of the opening of the bile-duct (*b.d.*, fig. 3). The above-mentioned œsophageal ridges bear, when near the stomach, long claw-like plates fixed only at their anterior ends. Both œsophageal (*p.œ.*, fig. 4) and gastric plates are freely movable on their bases of attachment.

In the stomach of two species of *Crepidula* \*, Haller has lately described swellings bearing a thickened projecting cuticle, and these he believes effect a retardation of the flow of food-material. These structures, from their general characters and position, must be the same as those met with in *Melongena*, where they are more strongly developed. The function of retardation in *Melongena* would, I think, be sufficiently ensured by the small calibre of the intestine, assuming that that function be necessary. It seems more probable that these tough, apparently chitinous, plates effect a trituration of the food, as is undoubtedly the case in *Pteroceras*, where similar cuticular processes exist †. The homology of the parts, as seen in *Pteroceras*, with the "sagitta tricuspidis" of Lamellibranchs has been pointed out by Barrois ‡

\* B. Haller, "Die Morphologie der Prosobranchier, iii.," *Morph. Jahr.* xviii. p. 502.

† T. H. Huxley, "Morphology of the Cephalous Mollusca," *Phil. Trans.* 1853, pp. 29, 66.

‡ T. Barrois, "Le stylet cristallin des Lamellibranches," *Revue Biol. du Nord*, 1890, No. 8, p. 310.

and others, and it seems reasonable to place the gastric plates of *Melongena* in the same category. The behaviour of these plates under the action of a few simple reagents has shown that chitin does not form a constituent, and also that their cuticular substance is similar to that of the "sagitta" and crystalline style, which in composition nearly approach mucin. These characters will be best expressed in a table :—

	KHO.	HCl.	Millon's reagent.	HNO <sub>3</sub> and NaHO.	CuSO <sub>4</sub> and NaHO.
Mucin .....	Soluble.	Soluble.	Proteid react.	Proteid react.	.....
Sagitta .....	"	"	"	.....	Proteid react.
Gastric plates.	"	"	"	.....	"

A histological examination of the gastric plates of *Melongena*, if the material had been better preserved, would have thrown light on their relations to the adjacent tissues ; but, as it happens, the condition of the parts did not admit of any definite interpretation. As seen in section, one of the gastric plates consists of a more or less hyaline matrix containing scattered cells (*ep.*, fig. 5) and nuclei. The cells vary much in shape, being either oval, circular, or fusiform, as shown in fig. 8. In one or two of the larger plates apparent lamellæ (*lm.*) occur, their lines of division appearing granular, and having the cells definitely arranged alongside. These lamellæ are not satisfactorily seen in the smaller plates. The basal part of each plate (*fb.*) assumes a fibrous character and passes gradually into the underlying structures, in which there is usually present a loose tissue containing lineally-disposed spaces. In one plate, at least, these spaces (*lc.*, fig. 5) will be found to decrease in size as they pass forwards, and the most anterior space becomes continuous with the line of division between two lamellæ. In many of the smaller sections there is present a dense and slightly fibrous layer (*sh.*, fig. 5) covering the cuticle (*ct.*). This investment in the smallest plates appears to be continuous with the intestinal epithelium (*ep.* of fig. 7), and in the larger ones it is absent from the greater part of the free surface. It has been, however, impossible to determine

the exact nature of this layer, as it and the neighbouring tissues were in an insufficiently preserved state\*.

The thickened cuticle in the stomach of *Crepidula*, according to Haller †, is perfectly homogeneous, without lamellæ, cells, or nuclei, and in these respects it differs from that of *Melongena*. In certain *Cestodes* (e. g. *Tania lineata*) there is present a lacunar tissue beneath the cuticle such as we have seen in *Melongena*, and its resemblance to the connective tissue of a mollusk has been shown by Griesbach ‡. The lacunæ are either empty or filled with granular contents, and both these conditions are met with in *Melongena*.

The structures which I have herein described are situated in the mesenteron, and are derivative of that portion of the alimentary canal, and they must therefore be distinguished from the plates and hooks met with in many other Gasteropods (e. g. *Aplysia* §), in which they occur in the parts derived from the stomodeum. These stomodeal plates, moreover, are chitinous in nature. Barrois compares the "sagitta" of the Lamellibranch and its representatives above the Gasteropods with the chitinous lining ("Trichter") of the gut of Insects and other Arthropods; but it seems doubtful whether he is right in doing this, seeing that while the "Trichter" is confined to the fore and hind gut, the mesenteron ("chylific stomach" of the Insects) is devoid of a cuticular lining and derivative of the hypoblastic midgut. The structures herein described are unlike the cuticular derivatives of the stomodeum and proctodeum, among the Invertebrates, developed internally to the alimentary epithelium, which may itself be converted into a cuticle-like covering where they occur (*ex. sh.*, fig. 7). So far as they may be compared to any known accessories of the alimentary system of other Mollusca, they suggest a kinship to the cartilaginoid supports of the odontophore.

For the material upon which this investigation has been performed I am indebted to the kindness of Mr. M. F. Woodward, and to Prof. G. B. Howes for many valuable suggestions.

\* It may be incidentally remarked that the structure of the plates has a superficial resemblance to masses of coagulated blood in the surrounding organs.

† Haller, *Morph. Jah.* xviii. p. 502, and *Taf.* 18. figs. 84-86.

‡ Griesbach, *Arch. für mikr. Anat.* xxii. 1883.

§ In the case of the chitin-bearing segment in *Aplysia*, there is wanting proof of its derivation from the stomodeum.

## EXPLANATION OF PLATE XXVIII.

- Fig. 1. *Melongena melongena*, entire animal. Partial dissection from the right side, chiefly to show position of stomach. (Natural size.)
- 2 *a.* Isolated alimentary canal. (Natural size.)
- 2 *b.* Part of œsophagus within proboscis, displayed. (Natural size.)
3. Stomach opened from above, with dorsal wall laid back; showing gastric plates. (Natural size.)
4. Dissection of stomach of another specimen, showing œsophageal plates. ( $\times 3$ .)
5. Longitudinal section of gastric plate. Obj. Zeiss A, Oc. 3.
6. Transverse section of gastric plate. Lenses as for fig. 5.
7. Transverse section of smaller plate. Obj. Zeiss D, Oc. 3.
8. To show leading types of cells in the cuticle of the gastric plates. Lenses combined as in fig. 7.

## REFERENCE LETTERS.

- b.d.* Bile-duct.
- ct.* Cuticular portion of gastric plate.
- ep.* Intestinal epithelium.
- fb.* Fibrous tissue.
- i.* Intestine.
- lc.* Lacunæ or spaces.
- lm.* Lamellæ.
- lv.* Liver.
- m.* Mantle.
- m.c.* Columella muscle.
- œ'*. Œsophagus.
- œ''*. Œsophagus within proboscis.
- op.* Operculum.
- pd.* Foot.
- p.g'*. Dorsal series of gastric plates.
- p.g''*. Ventral series of gastric plates.
- p.œ.* Œsophageal plates.
- r.* Rectum.
- sh.* Sheath.
- st.* Stomach.
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